PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

To:

see form PCT/ISA/220

PCT

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43*bis*.1)

Date of mailing
(day/month/year) see form PCT/ISA/210 (second sheet)

Applicant's or agent's file reference
see form PCT/ISA/220

FOR FURTHER ACTION
See paragraph 2 below

International application No.	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/EP2004/007588	09.07.2004	15.07.2003

International Patent Classification (IPC) or both national classification and IPC
G05G9/047, B25J17/02

Applicant
FORCE DIMENSION S.A.R.L

1. This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☒ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☐ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☐ Box No. VII Certain defects in the international application
- ☐ Box No. VIII Certain observations on the international application

2. **FURTHER ACTION**

If a demand for international preliminary examination is made, this opinion will usually be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA"). However, this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1*bis*(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of three months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

3. For further details, see notes to Form PCT/ISA/220.

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Box No. I Basis of the opinion

1. With regard to the **language**, this opinion has been established on the basis of the international application in the language in which it was field, unless otherwise indicated under this item.

   ☐ This opinion has been established on the basis of a translation from the original language into the following language , which is the language of a translation furnished for the purposes of international search (under Rules 12.3 and 23.1(b)).

2. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application and necessary to the claimed invention, this opinion has been established on the basis of:

   a. type of material:

   ☐ a sequence listing

   ☐ table(s) related to the sequence listing

   b. format of material:

   ☐ in written format

   ☐ in computer readable form

   c. time of filing/furnishing:

   ☐ contained in the international application as filed.

   ☐ filed together with the international application in computer readable form.

   ☐ furnished subsequently to this Authority for the purposes of search.

3. ☐ In addition, in the case that more than one version or copy of a sequence listing and/or table relating thereto has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.

4. Additional comments:

Box No. II Priority

1. ☒ The following document has not been furnished:

   ☒ copy of the earlier application whose priority has been claimed (Rule 43*bis*.1 and 66.7(a)).

   ☐ translation of the earlier application whose priority has been claimed (Rule 43*bis*.1 and 66.7(b)).

   Consequently it has not been possible to consider the validity of the priority claim. This opinion has nevertheless been established on the assumption that the relevant date is the claimed priority date.

2. ☐ This opinion has been established as if no priority had been claimed due to the fact that the priority claim has been found invalid (Rules 43*bis*.1 and 64.1). Thus for the purposes of this opinion, the international filing date indicated above is considered to be the relevant date.

3. Additional observations, if necessary:

Box No. V Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	2-7,9-20,22
	No:	Claims	1,8,21
Inventive step (IS)	Yes:	Claims	4,5,9-14
	No:	Claims	1-3,6-8,15-22
Industrial applicability (IA)	Yes:	Claims	1-22
	No:	Claims	

2. Citations and explanations

   see separate sheet

Re Item V

Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. The following documents (D) are referred to in this communication; the numbering will be adhered to in the rest of the procedure:

   D1: Patent Abstracts of Japan, vol. 1999, no. 08 - 30 June 1999 -& JP 11058286 A (Murata Machinery Ltd) - 2 March 1999

   D2: T.Arai, J.M. Herve, T. Tanikawa: "Development of 3 DOF Micro Finger" Proceedings of the 1996 IEEE/RSJ International Conference on Robots and Systems (IROS), Osaka, 4 - 8 November 1996, published in New York, USA, 4 November 1996, vol. 2, pages 981-987, XP000771586 ISBN: 0-7803-3214-8

   D3: S.Grange, F.Conti, P.Helmer, P.Rouiller, C.Baur: "The Delta Haptic Device" Mecatronics, July 2001, Besançon, France; Retrieved from the Internet on 05-12-2003: http://vrai-group.epfl.ch/papers/MECATRONICS01-SG.pdf XP002265012

   D4: DE 19720049 A (Leitz Brown & Sharpe Meßtechnik) - 19 November 1998

2. **Preliminary remarks: clarity objections (Article 6 PCT) and interpretation of claims 1 and 2**

   The application does not meet the requirements of Article 6 PCT, for the following reasons:

   2.1. It is not clear what the "parallel kinematic transmission structure" exactly designates. On the one hand, it is explained in the description that the parallel kinematic transmission structure is composed of three functionally parallel kinematic chains (see page 2, lines 22 to 24 and page 13, lines 3 to 8). On the other hand, in claims 1 and 2, the expression "parallel kinematic transmission structure" seems to designate each one of the kinematic chains and the description itself is somewhat inconsistent (see for example page 13, lines 28 to 30).

   The examining division considers that the expression "parallel kinematic

transmission structure" can only designate the mechanism **as a whole** because one single kinematic chain itself can not constitute a parallel kinematic structure, which contains by definition **several** parallel kinematic chains.

2.2. From the foregoing, the examining division also considers that the rotary actuators and the control arms are part of the parallel kinematic transmission structure, contrary to what emerges from claim 1.

2.3. In the description, no element could clearly support an embodiment wherein the device for transmitting a movement would have several moveable members. It is therefore suggested to replace the expression "*at least* one moveable member" by "one moveable member" in claim 1.

2.4. The expression "any translational movement is transmitted into a rotational movement, or vice versa" is vague. It is therefore suggested to replace it by "any translational movement **of the moveable member** is transmitted into a rotational movement **of the control arms** or vice versa".

2.5. The base member is essential to the definition of the invention and should therefore be included in claim 1, as required in the PCT International Search and Preliminary Examination Guidelines, paragraph 5.33.

2.6. Concerning claim 2, even if the parallel mechanism structure developed by Professor Clavel is one of the most famous parallel robot designs, it is not certain that name "Delta", which was given by Mr Clavel himself, is universally known and used.

According to the PCT International Search and Preliminary Examination Guidelines, paragraph 4.25, claim 2 should be clarified by explicitly introducing the following features of the description (see page 2, lines 25 to 31 and page 7, lines 10 to 14):

> The parallel kinematics transmission structure comprises three parallel kinematics chains, each chain comprising a pivoting control arm and a pair of parallel linking bars hingedly mounted by two rotational degrees of freedom joints at one end to an extremity of the control arm and at

the other end to the moveable member.

2.7. To summarize all the clarity objections above, claim 1 has been interpreted as follows:

A device for transmitting a movement having a parallel kinematics transmission structure (3) providing three translational degrees a freedom, said structure comprising:

- one base member (1)
- one moveable member (2)
- at least one rotative actuator (30) arranged on the base member (1)
- parallel kinematics chains coupling the base member to the moveable member, each chain comprising a pivoting control arm (10),
- wherein the rotary motion of the at least one rotative actuator (30) is transmitted to a respective pivoting control arm (10) so that any translational movement of the moveable member is transmitted into a rotational movement of the control arms or vice versa,
- and wherein the at least one rotative actuator (30) is arranged such that its axis (31) is substantially perpendicular to the rotation axis of the control arms (10).

Claim 2 has been interpreted as follows:

The device according to claim 1, wherein the parallel kinematics transmission structure comprises three parallel kinematics chains, each chain comprising a pivoting control arm and a pair of parallel linking bars hingedly mounted by two rotational degrees of freedom joints at one end to an extremity of the control arm and at the other end to the moveable member, thus forming a delta type arrangement, wherein each chain is provided with a respective rotative actuator and wherein the rotative actuators are arranged such that their axis are substantially parallel to each other.

3. **Claim 1: lack of novelty**

The present application does not meet the requirements of Article 33(1) PCT, because the subject-matter of claim 1, as interpreted in paragraph 2.7. above, is

not new in the sense of Article 33(2) PCT. The document D1 indeed discloses (the references in parentheses applying to this document):

> A device for transmitting a movement having a parallel kinematics transmission structure providing three translational degrees a freedom, said structure comprising:
> - one base member (22)
> - one moveable member (21)
> - at least one rotative actuator (1) arranged on the base member
> - parallel kinematics chains coupling the base member to the moveable member, each chain comprising a pivoting control arm (7,13,30),
> - wherein the rotary motion of the at least one rotative actuator is transmitted to a respective pivoting control arm so that any translational movement of the moveable member is transmitted into a rotational movement of the control arms or vice versa,
> - and wherein the at least one rotative actuator is arranged such that its axis is substantially perpendicular to the rotation axis of the control arms.

All the features of claim 1 are therefore known from D1.

4. **Dependent claims 2, 3, 6 to 8 and 15 to 22**

Dependent claims 2, 3, 6 to 8 and 15 to 22 do not appear to contain any additional features which, in combination with the features of any claim to which they refer, meet the requirements of the PCT with respect to novelty and/or inventive step, the reasons being as follows:

4.1. Concerning claims 2 and 3, it appears clearly from the figures of D1 that the parallel kinematics transmission structure disclosed in this document is of the delta type, as exactly defined in paragraph 2.6. above. The structure is provided with a single rotative motor, which is fixed on the base member (22), which transmits its rotary motion by means of gears (1a,2) to three parallel drive shafts (2a). For the skilled person, it would be obvious to replace the single rotative motor by three rotative motors being in close relationship to each other and having parallel shafts. The subject-matter of claims 2 and 3 therefore lacks inventive step.

4.2. Concerning claims 6 and 7, document D2 shows that the use of flexible hinge articulations made from one piece instead of pivot or cardan joints is well known for parallel kinematics structure. It would be obvious for the skilled person to use such flexible hinge articulations in the parallel kinematics transmission structure discloses in D1. The subject-matter of claims 6 and 7 therefore lacks inventive step.

4.3. Concerning claim 8, the pivoting control arms (7,13,30) of the device disclosed in D1 are provided with restoring elements (6,12,31) providing a restoring force against the force exerted by the rotative actuator (1).

4.4. Concerning claims 15 to 20, document D3 shows that the haptic devices are one of the well-known applications for parallel kinematics transmission structures. It would be obvious for the skilled person to use the kinematics transmission structure disclosed in D1 as an haptic device. The claims 16 to 20 only introduce features which are well known for such devices. The subject-matter of claims 15 to 20 therefore lacks inventive step.

4.5. Concerning claim 21, the device disclosed in D1 is used as a manipulator for transporting goods with three translational degrees of freedom.

4.6. Concerning claim 22, document D4 shows that the measuring systems providing at least three translational degrees of freedom to a sensor element are one of the well-known applications for parallel kinematics transmission structures. It would be obvious for the skilled person to use the kinematics transmission structure disclosed in D1 as a measuring device. The subject-matter of claim 22 therefore lacks inventive step.

5. **Other dependent claims**

The combination of the features of dependent claims 4, 5 and 9 to 14 is neither known from, nor rendered obvious by, the available prior art.

6. **Industrial applicability**

The claims 1 to 22 satisfy the criteria of industrial applicability as defined for the purposes of the international preliminary examination in Article 33(4) PCT.